REMARKS

This Amendment is in response to the Office Action of September 21, 2006, in which claim 15 and 16 were allowed, claims 1, 4, 7, 8, and 10-12 were rejected, claim 2 was objected to, and claims 3, 5, 6, and 9 were withdrawn from consideration. With this Amendment, claim 2 has been amended. As a result of this Amendment, claims 1-12, and 15-16 are in condition for allowance.

In the Office Action, claim 2 was objected to because of an informality in line 3. With this Amendment, the informality has been corrected.

Claims 1, 4, 7, 8, and 10-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Applicants Admitted Prior Art (AAPA) in view of Dimigen et al. U.S. Patent No. 3,904,462. The present invention, as defined in independent claim 1, and in dependent claims 4, 7, 8, and 10-12, is neither taught nor suggested by the AAPA alone or in combination with Dimigen.

The AAPA as described in FIG. 1 and in the specification at page 3, makes use of a thick photoresist mask 18 to define the stripe height of magnetoresistive sensor 14. This prior art technique, however, has several significant problems, as discussed at page 1, line 18 through page 2, line 11, and again at page 3, line 26 through page 5, line 6. In particular, the use of photoresist layer 18 in patterning sensor 14 and defining the stripe height causes tail 16 and redeposition material 20 shown in FIG. 1.

The first problem is tail 16 of sensor 14 which is material that was not removed during removal of unmasked portions of sensor 14. Tail 16 is caused by a shadowing effect of photoresist mask 18 on sensor 14. Tail 16 is detrimental to the sensitivity of reader 10, because the different layers of sensor 14 have different dimensions. In particular, the lower layers which are closer to first half gap 12 are significantly longer than those near the top of sensor 14, adjacent photoresist layer 18. Tail 16 can also result in shunting of current flowing between nonadjacent layers of sensor 14, which will reduce the sensitivity of the reader.

The second problem is the formation of redeposition material 20 during the removal of unmasked portions of sensor 14. The redeposition material 20 forms along the back edge of photoresist mask 18. This can result from the sputtering of material from sensor 14 onto

the back edge of photoresist mask 18 during ion milling. This redeposition material 20 can protrude through subsequently deposited layers of reader 10. It can also make unwanted electrical connections between sensor 14 and other parts of the magnetic head.

In the past, the redeposition material problem has been addressed by attempting to remove redeposition material 20 after the removal of photoresist layer 18. These efforts, however, can result in damage to the magnetic head.

While the prior art process, representing the AAPA, produced the tail and redeposition material problems, the AAPA did not provide a solution to those problems. That solution was provided by the present invention. The present invention eliminates both tail 16 as well as redeposition material 20 produced using the prior art process.

Dimigen shows the use of a titanium or aluminum oxide mask during ion etching. It describes the advantage of using a material with an etching velocity that is independent of the angle of incidence of the etching ion beam when etching deep structures.

Dimigen merely describes the use of a hard mask in ion etching, but does not teach or suggest the use of a hard mask as a potential solution to the problems present in the prior art magnetoresistive sensor fabrication, as illustrated in FIG. 1 of the present application. Dimigen does not describe the problem of a tail region like tail 16 shown in FIG. 1. Nor does it describe the problem of redeposition material 20 as shown in FIG. 1.

With the present invention, hard mask 36 is a very thin masking layer (on the order of 25 nanometers), which is much less than the thickness of photoresist layer 18 shown in FIG. 1. As a result, hard mask 36 does not cause a shadowing effect, and allows formation of a tail free steep back edge as illustrated in FIG. 6.

During the etching of sensor 34, hard mask 36 is a sacrificial layer that is also slowly removed. Because all exposed layers are being etched during the etching process, redeposition material from sensor 34 cannot form on the back edge of hard mask 36 or other locations of the reader. Thus, hard mask 36 solves both the tail problem and the redeposition material problems present in the prior art.

There is no suggestion in the AAPA or in Dimigen that the use of a hard mask in the formation of a magnetoresistive sensor would overcome significant shortcomings in the prior

art processes used for making these devices. Hard masks have existed since at least 1975 (when Dimigen issued), and certainly were known before magnetoresistive sensors began being fabricated and used in magnetic storage devices such as disc drives.

It is only with the benefit of hindsight and Applicant's teaching that a combination of Dimigen with the AAPA is made. Independent claim 1 and dependent claims 4, 7, 8, and 10-12 define a method which is not obvious over the AAPA and Dimigen, and the rejection under 35 U.S.C. § 103 should be withdrawn.

As a result of the amendment, claim 2 which was objected to is now in condition for allowance. In addition, claims 3, 5, 6, and 9 which depend from claim 1 and which were withdrawn from consideration, are now in condition for allowance.

In conclusion, this Amendment places the application in condition for allowance. Notice of allowance of claims 1-12, 15 and 16 is requested.

Respectfully submitted,

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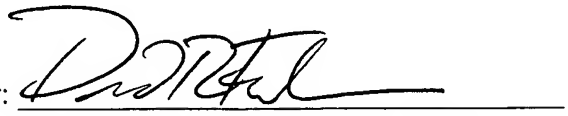
By: 

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